

MARIE

September 2003 Status – Science Data Comments

During September 2003, the MARIE instrument provided radiation data continuously with the usual short breaks due to data download and erase sequences. MARIE operation continues to be nominal. For September, MARIE was in science mode acquiring data about 85.6% of the time, equivalent to 25.7 days. Also, it should be noted that the orientation of the MARIE instrument with respect to the Mars varied during the later part of the month. These changes in the MARIE orientation are due to the *2001 Mars Odyssey* spacecraft orientation changes that were required as part of the data relay testing for future rover missions, MER-A and MER-B. As there was no unusual solar activity at this time, MARIE was measuring galactic cosmic radiation (GCR) only, for which the orientation of the instrument is not critical owing to the isotropy of the particle flux.

The average measured dose rate was 21.9 ± 4 mrad/day as measured by the A1 counter and 22.0 ± 4 mrad/day as measured by A1-A2 coincidence data. The uncertainties in the dose rates reflect the present state of our understanding of the instrument properties (geometry factor, trigger threshold, etc.) that go into the normalization factors used to convert count rate to dose rate. The science team continues working to minimize these uncertainties.

A slightly increasing trend in the dose rate can be seen in Figure 1 – 4 below. There were no Solar Particle Events (SPE) noted in the month of September. For the month of September, the model prediction of the average quiet-time GCR was 19.8 mrad/day while the MARIE measured dose rate was 22 mrad/day. Thus, the MARIE measurements are within about 10% of the predicted model calculations, however, uncertainties in the MARIE measured data are currently estimated to be $\pm 20\%$. The model predicted a dose rate decrease during the later part of September, which goes in the opposite direction from the trend actually seen in the data. The science team is working to evaluate these variations.

The average Earth-Sun-Mars angle during September-2003 was about 5.92° with Earth at 1.01 AU and Mars at 1.38 AU.

September 2003: Model Calculations vs. MARIE Measurements

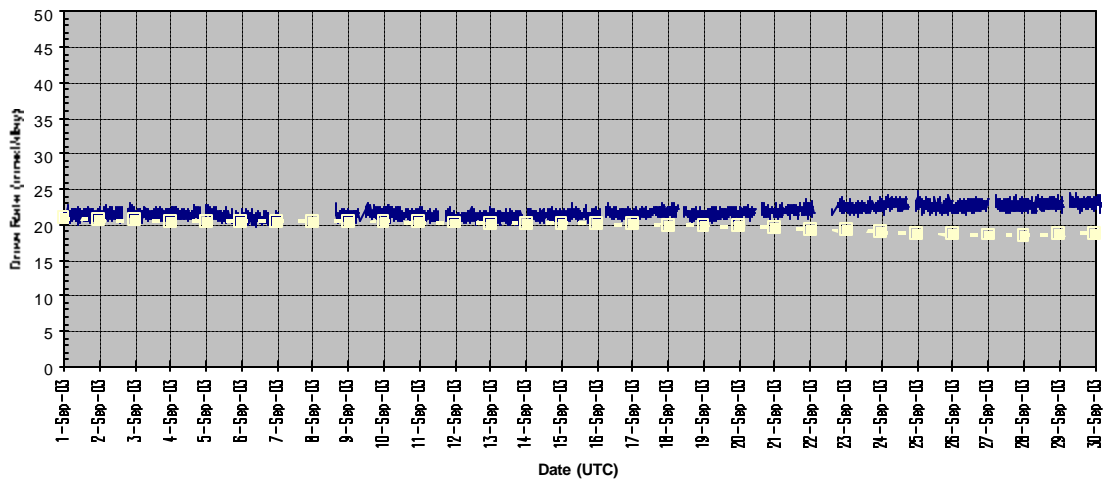


Figure 1: Radiation dose-rate from the GCR contribution in the Martian orbit during September 2003. Dose-rate (mrads/day) measurements from MARIE (blue discrete line) are shown along with the model predictions (yellow dotted line). The average dose-rate is within 10% of the model predictions. Also, see Figure 2.

September 2003: Model Calculations vs. MARIE Measurements

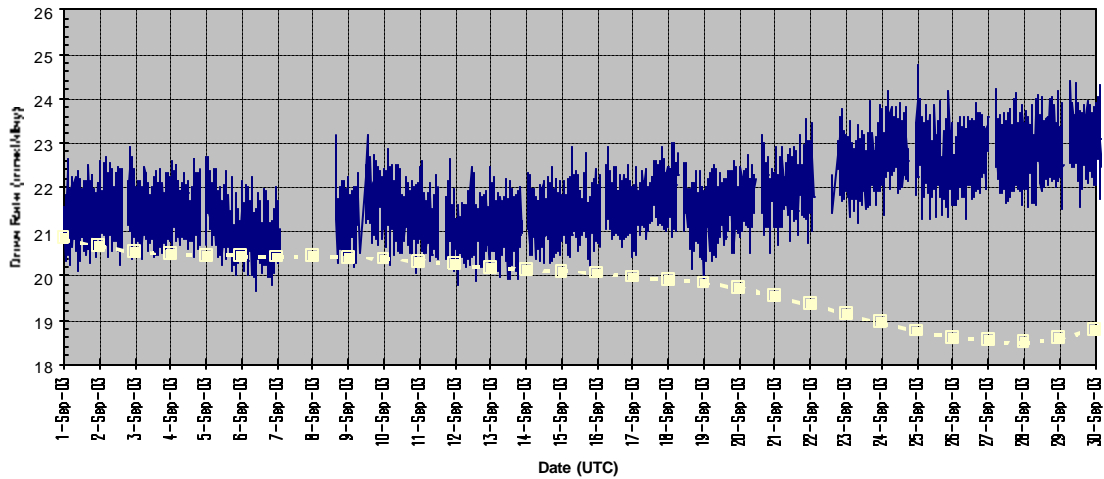


Figure 2 (Close-up view of Figure 1): Radiation dose-rate from the GCR contribution in the Martian orbit during September 2003. Dose-rate (mrads/day) measurements from the MARIE instrument (blue discrete line) are shown along with the model predictions (yellow dotted line). Short-term GCR modulations of the MARIE measurements seem to occur at the model predicted time but in the opposite direction.

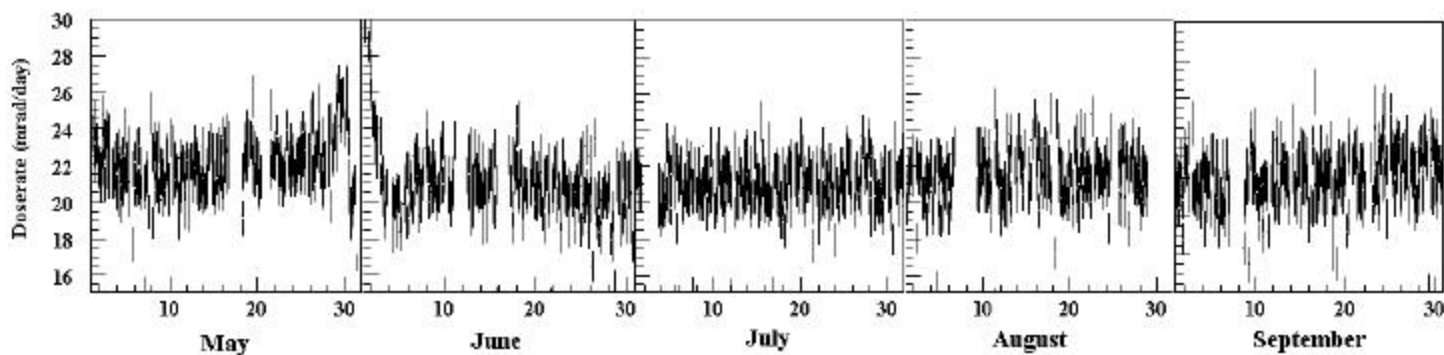


Figure 3. MARIE dose rate measurements from May through September 2003. The most recent SPE observed was May 31-June 3.

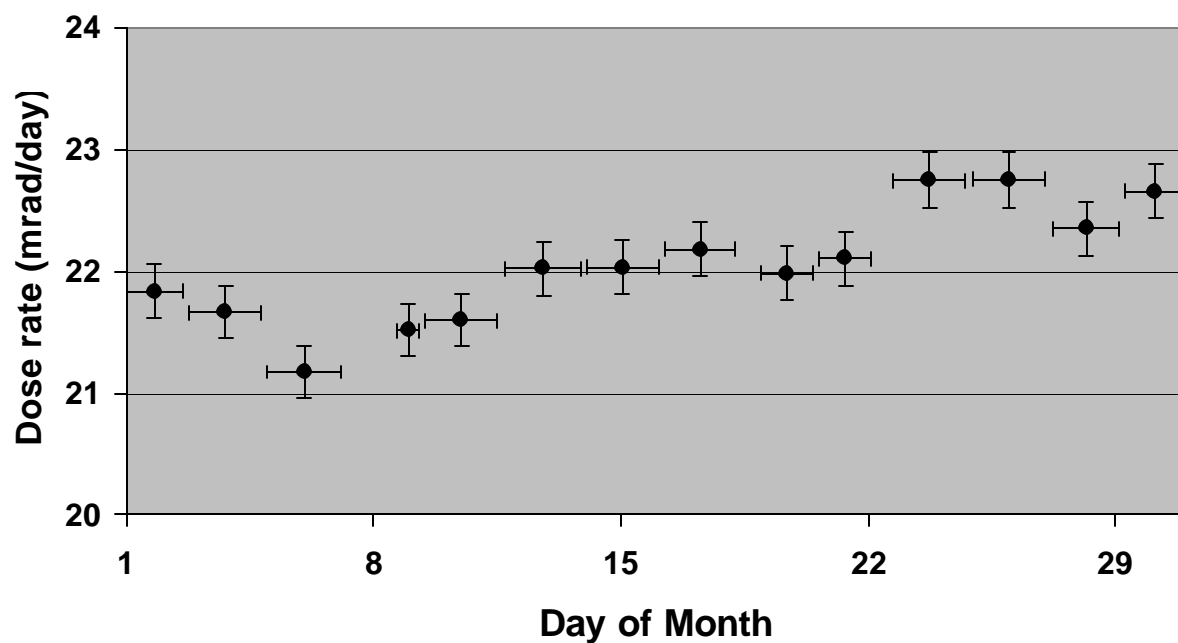


Figure 4. Dose rate for September in wide time bins, showing the upward trend starting around September 12.